

To Grasp the Meaning of Natural Language by a Code of Behaviors the Sense Machine

Peter H. Pfeifer, Julian Pfeifer, and Niko Pfeifer

Abstract—A major field of application of linguistic texts is to reflect the ordinary activities of life as well as the interpersonal relationships of people. Previous approaches of cognitive science have still not achieved a successful breakthrough. Until now the human factor has been neglected in the process. For the semantic grasp of such natural language texts a new system called Sense Machine is presented here. This system uses a psychologically based method to dismantle terms in a fashion similar to nuclear physics that dismantles an atom. The components of dismantling consist of psychological Basic Activity Elements. They build a unitary Code of Behaviors through a variety of combinations. A special Code variety corresponds to a special behavior. This Code gives the computer, the topic and the motivation of human behavior without text corpora in real time during a dialog. Longer texts can be psychologically evaluated.

Index Terms—Code of behaviors, content capture, natural language text, psychological evaluation, recognition of implied motivations in natural language.

I. INTRODUCTION

One important aim of cognitive science in the field of Artificial Intelligence research is to bridge the gap between computer technology and the natural language of humans. There are a variety of different approaches in cognitive science, such as connectionism and embodiment, for example by Steels [1]. However, all these approaches do not lead to a unitary system that identifies human striving, but rather as special complexes of human basic instincts.

In the “Conceptual Dependency” [2] eleven major activities are defined. Together with a number of conceptual categories, they allow to build a limited representation of human behavior. Till now it is not possible to have conversations between computer and humans about normal things of daily life as humans have it together. Sense Machine gives the possibility to have it.

Distributional semantics is a corpus-based method to identify the meaning of text with representing word meanings as vectors [3], [4]. It works similar to macro physics. It looks from outside over the terms (with text corpora).

In contrast Sense Machine dismantles a term in a way similar to nuclear physics. Just as an atom can be dismantled into proton, neutron, and electron, a term is dismantled in parts.

There are large and small nuclei which are build up from uniform core elements. So as different nucleus compositions

lead to different elements, the different compositions of the core blocks leads to different terms.

The core blocks are formed from basic activity elements (derived from basic instinctual drives), seeing in Fig. 1.

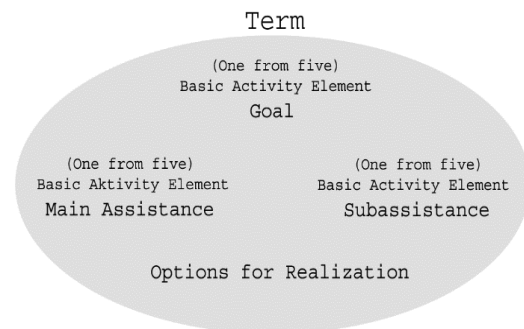


Fig. 1. Example of a term with its parts.

The dimensions of the Sense Machine do *not* work with feature norms. Sense Machine leads to a unitary system that identifies human behavior as special complexes of instinctual drives.

Until now, the Sense Machine has 1000 fixed activities and 1000 concepts (possibly far more) which are defined by a five-factor-system. They trace back to the basic instincts. Sense Machine should be able to assign actions to human motivations and thus “understand” as far as possible for a machine.

Additional elements of artificial intelligence, such as morphological analysis, taxonomy, recognizing grammar, time (and tense), negation, active/passive voice and quantities are not within the scope of the Sense Machine but they are needed as a substructure.

Sense Machine bridges the gap between the standard work on logic and inferences to humans striving by motivations, and instinctual goals independent of logic. The use of both systems could facilitate the best transition, from human aspiration to knowledge databases.

II. BASIS FOR THE PRINCIPLE OF THE SENSE MACHINE CODE (CODE)

A. General

The Code decomposes activities to its parts from a psychological point of view. An example from everyday life is ‘bring’ and ‘fetch’. Both have in common the Basic Activity Element to move toward a target. In addition, ‘bring’ helps someone to get something, whereas ‘fetch’ focuses on taking possession of something. Both are mobile activities combined with another goal. (These are no compound terms, no

taxonomy, and no word stem processing).

The multifaceted human world contains (until now, an undiscovered) core symmetry; the system presented here takes advantage of this fact in order to obtain a better understanding of human motives and the associated human conversation.

Essentially, the Code consists of five Basic Activity Elements that are repeated over and over again. The Basic Activity Elements are differentiated by the levels and the structure of the Code combinations. *In its entirety, the Code forms a semantic grid that allows a superior simplistic analysis by the computer due to its symmetry.*

It is for the developmental psychology to find the answer to the question: Why these particular below listed five activities, which makes it possible to map so many behaviors in the area of material needs, constitute the key building Basic Elements? The exploration of the basics of the developmental psychology is old but absolutely valid for understanding the principle of the Sense Machine. In these old psychological explorations are found the basics for human behaviors.

Five instinctual drives are developed in childhood: Oral, anal, genital, [5], [6] urethral drives [5], and the intentional drive [7]. Because these basic drives are essential for surviving they build the five basic roots for all behaviors of humans. Sense Machine shows that at least thousands of behaviors and things go back to the basic instincts.

B. Options for Realization

Further important elements of the Sense Machine are the Options for Realization.

The behaviors develop in four stages of childhood which correspond with the following psychological term classification [8]. The *Options for Realization*:

- 1) Heteronomous-concentric (external determination / focus on me and mine).

“Heteronomous-concentric” is an activity (more precisely passivity) that concentrates on own needs and is waiting for fulfilling that depends on others or special circumstances.

- 2) Autonomous-concentric (self-determined / focuses on me and mine).

“Autonomous-concentric” is a self-determined activity directed in the inside world. The inside world is all within my circle, all that I am able to grasp. It reaches from all that is in my possession to all that is within my power to take it.

- 3) Autonomous-eccentric (self-determined / external focus).

“Autonomous-eccentric” is a self-determined action directed in the outside world. It reaches from movements in the outside world without any conflicts with others by using fields that are free to use, to movements against others that leads to conflicts.

- 4) Heteronomous-eccentric (external determination / external focus).

“Heteronomous-eccentric” is activity in the outside world adapted to rules from other people. For example, travelling by a bus: - The bus collects some passengers and has its own special rules and routes. If I wish to go by that bus, then I must adapt to this and go together with the other passengers; so I adapt heteronomously to these circumstances to reach a destination.

For example buying: The seller determines the selling price. The buyer has to pay it. So he must adapt to the rules of the seller.

The later shown tables use these four Options for Realization for the columns.

C. The Phases of Childhood

Five basic instincts develop in the four stages of childhood [5]-[7] and in each stage arises basic activities, which are important for the survival:

- 1) Oral drive is for *getting*. Imagine someone would never get something. He would die already as a baby.

In the oral phase the human is a baby. A baby cannot go to the next grocery he/she can only wait till mother or father comes and feeds him. So the baby *gets* something. What happens to the child is determined by others (heteronomous/concentric).

- 2) Anal drive is for *disposing of*. Imagine someone has nothing at his disposal. No money, no home, no clothing, no food stock. He could only survive by social help.

In the anal phase the young child learns I and you, mine and yours. It results finally in: I determine what happens to me and my possessions (autonomous/concentric); you determine what happens to you and your possessions.

- 3) Genital drive is for *striving*. Imagine someone could not move, could not reach any destination because he is paralyzed. He could only survive by social help.

The first sexual appeals arise in the genital phase. Further the child learns how to make targeted appeals combined with the ability to move about more readily. This means it can now run fast and maybe faster than others. This appeal and running out into the world is focused externally (eccentric) and self-determined (autonomous).

- 4) Urethral drive is for *performing*. This is a special drive for helping other people. Performing a profession is helping other people. (A farmer makes food for people, a craftsman makes work for people etc.) A community without performers (helpers) would reduce the survival of itself.

In the urethral phase, the so-called achievement phase, the child learns performing. The child learns to pursue activities that are desired by others. Particularly in school, the child learns to achieve those things that are determined by the teacher (heteronomous/eccentric).

- 5) Intentional drive is for *informing*. Imagine someone is not able to get information because he is blind and deaf. He could only survive by social help.

The intentional ability to turn attention to someone or something develops in the oral phase too (first heteronomous/concentric – later heteronomous/eccentric).

The activities of the phases of childhood serve to reach the special goals of the basic instinct directions. These are:

- 1) to have got something,
- 2) to realize the will,
- 3) to achieve goals,
- 4) being recognized for performance,
- 5) being informed.

The basic skills and activities that are learned in the phases of childhood development are the building blocks that the human will use again and again in adult life. They are the first

building blocks for all the mathematics that follows. This classification gives the basic dimensions of adult human behavior. From the combination of the instinctual goals with the *Options for Realization*, the matrix (Table I) arises [9].

Sense Machine shows that there are not only five (or seven) behaviors for reaching the instinctual goals. There are more than a thousand by combinations. Similar to the mixing of colors, the five basic activities can be mixed (combined). Because they are the basic building blocks, they generate in combination a large number of activities.

TABLE I: BASIC ACTIVITY ELEMENTS FOR INSTINCTUAL GOALS

Instinctual Goals	heteron. / concentr	autonom. / concentric	autonom. / eccentric	heteronom. / eccentric
1 oral got	wait for	<i>get</i>		
2 anal realizing the will		<i>dispose of, determine, control</i>		
3 genital achieving goals			<i>strive, go, move towards</i>	
4 urethral being recognized				<i>perform, serve</i>
5 intentional information	turn towards			<i>inform, curiosity</i>

The principle is as follows: One part of the mixing (combination) represents the goal. Another part makes assistance. For example for basic instinct goal 1, basic instinct 3 is used as assistance. Additionally, it is possible to have a further assistance: for example, the subassistance 4. That results in goal 1- help 3- sub help 4 and so on. These numbering is the coding. It gives the goal and the helping components.

In this manner Sense Machine reduces thousands of activities and things to five numbers in different combinations and sequences. This gives some crucial advances. The goal in the sense of the basic instinct is identified at once. To grasp the meaning needs no text corpora. One term or a small sentence can be enough for recognizing the objective and the context. Because Sense Machine works with the human needs it can go into these needs at once. This is an important feature for a dialog. The Code is very computer usable because there is a strong hierarchy with only a few elements.

The first step is to show combinations, see Table II. Each row of the matrix shows in the initial column, the Instinctual Goal, and in the following positions the activities that serve the goal. In contrast to Table I each empty field is filled with activities that arise with the further development of the child. These developed activities serve the goals too [9].

autonomous-concentric in Table I). It reaches from having something at his/her disposal to having something within his/her power (it can be enforced). The object in question can be controlled and determined at will. The goal is to realize the will in connection with an object.

- 3) “Striving” (located at row 3 Genital, column autonomous-eccentric in Table I). An activity that needs time and efforts to reach a goal. The moment of striving is meant, while the efforts are made to reach the goal and it is not 100% clear whether it reaches the goal or not because the end of the efforts is not yet reached. This activity is self-determined.
- 4) “Performing” - translated from German word “leisten” - (located at row 4 Urethral, column heteronomous-eccentric in Table I). An activity that leads to recognition by others because this activity is for others. It is a helping activity. I can help with more success if I have learned special abilities in a profession and in the material area I get money for it. Every employee in a company helps for the goals of the company and every company works for the customers.
- 5) “Informing” (located at row 5 Intentional, column heteronomous-eccentric in Table I). Find the needed special information as well as news that interests people. To have information is the goal of the process: “informing”. Information is important for finding needed things, for clarify usability, for knowledge of processes, for performances, for orientation and so on.

TABLE II: ACTIVITIES AND BASIC ACTIVITY ELEMENTS FOR INSTINCTUAL GOALS

Instinctual Goals	heteron. / concentr	autonom. / concentric	autonom. / eccentric	heteronom. / eccentric
1 oral Got	wait for	<i>get</i>	ingest, eat; take	get a share; let have a share
2 anal realizing the will	expect	<i>dispose of, determine, control</i>	designe, configure	exchange, barter
3 genital achieving goals	interrupt	prepare moving, strengthen	<i>strive, go, move towards</i>	synchronised move
4 urethral being recognized	wait out	advise, promise	execute	<i>perform, serve</i>
5 intentional information	turn towards	disclose, explain	address, ask around	<i>inform, curiosity</i>

Fig. 2 shows the way from Goals to Realization. The motivations (1–5) are combinable (see next section).

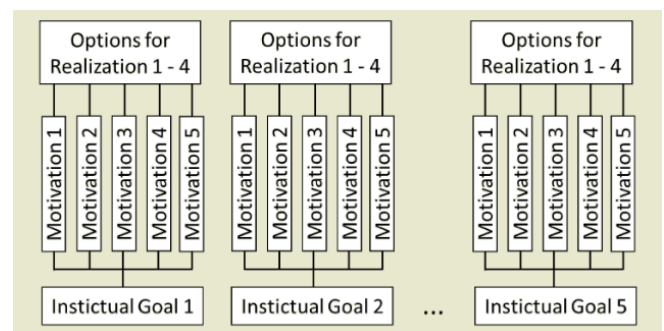


Fig. 2. Instinctual Goals — Motivations — Options for realization.

III. DEFINING OF BASIC ACTIVITY ELEMENTS

- 1) “Getting” - translated from German word “bekommen” - (located at row 1 Oral, column autonomous- concentric Table I) To receive something without use of own power by the receiver. If the objects of getting are not handed over, getting needs assistance by “disposing” or “striving”.
- 2) “Disposing of” - translated from German word “verfügen” - (located at row 2 Anal, column

IV. THE CODE OF THE SENSE MACHINE

The next step for enabling the Code that consists of combinations of activities is as follows:

The Code is based on the Table II, but instead of the instinctual goals, the Basic Activity Elements are used which refer to these goals (see gray fields).

The new thing is that the goals are not shown in the initial line but only the main activities that at first developed in the phases of childhood the Basic Activity Elements (short BAE): *getting*, *disposing of*, *striving*, *performing*, and *informing*.

The Code essentially consists of these five BAE which are combined together in varying order and number. In the following examples the five BAE are drawn from the area of material needs.

The Code does *not* operate with taxonomy, but rather as mixtures of five Basic Elements that are ordered by the drive relationship.

The Top Level of combination comprises:

$5 \text{ BAE} \times 4 \text{ Options for Realization} = 20 \text{ activities} = 1 \text{ matrix}$

For the step from one level to the next, each line is further divided into five more.

Increasing the number of elements through a higher differentiation is like multiplying it with itself. Once again the differentiating elements are identical with the initial elements (the BAE). This makes for the symmetry of the Code.

getting				
disposing of				
striving				
performing				
informing				

Fig. 3. Top Level: 5 elements * 4 Opt. = 20 activities = 1 matrix.

They are often combined (*similar to color mixing*), as can be seen in Fig. 3 - Fig. 5. The columns of the matrices contain the *Options for Realization* as described above.

With this principle, the Sense Machine is able to draw on far more than thousand behaviors (activities) and can represent also several thousand man-made objects and concepts in Code.

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Fig. 4. The 1st Sublevel gives rise to: $5 * 5 * 4 \text{ Options} = 100 \text{ activities} = 5 \text{ matrices}$.

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Fig. 5. The second Sublevel gives rise to: $5 * 5 * 5 * 4 = 500 \text{ activities} = 25 \text{ matrices}$.

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Fig. 6. The 2nd sublevel with thematic complexes.

Over 1000 activities are already defined with a 4-dimensional definition. More are possible with higher dimensional definition.

Sense Machine decomposes the human behavior into its parts from the five BAE. In material world, each element is returned to its respective components of *getting*, *disposing of*, *striving*, *performing* and *informing* in accordance with the various combination levels.

In a Code, one Basic Activity Element (BAE) represents the goal. This Basic Activity gets assistance from the admixture of one or more other BAE (see Fig. 1.)

Reversed: The Code *enforces* the activities in the matrices by these BAE and the four *Options for Realization*.

The elements of the matrices consist of activity units (activities) - single verbs or small sentences. (Observe difference: (5) *Basic Activity Elements* : (1000) activities.)

In relation to the instinctual goals, all areas of human behaviors are correlated together. Sense Machine allows multi-layered access to activities, things and concepts, and a portion of the adjectives. The assignment of activities for material needs is explained in more detail below.

V. BREAKDOWN OF EXAMPLES FROM 2ND SUBLEVEL

A. Mobility

In the matrices index of the 2nd Sublevel Fig. 6 (see above), the material needs are divided in the complex of obtaining, the complex of disposing of, the complex of mobility, complex of business and the complex of informing.

Again each complex consists of 5 matrices in relation to *getting*, *disposing of*, *striving*, *performing*, and *informing*.

I will now discuss an example:

Strive to a geographical destination by disposing of = *drive*.

Since here I am only focusing on activities, the destination and the agent used (the objects) is left out.

It would be the matter of object matrices, which is not the issue here now. (Objects will only be considered as far as their necessity for the specification of activities.)

The acting subject, the person who wants to reach the destination, is disregarded too.

The first step consists in looking up the activity in the above matrices index of the 2nd Sublevel (Fig. 6). The complex of mobility (*striving*) includes:

- in the column *getting*, the procurement of things that can be used for mobility (tickets, rental cars, etc.),
- in the column *disposing of*, the dispositions that are suitable for this mobility,
- in the column *striving*, the actions that serve the mobility,
- in the column *performing*, the services that are used to transport people and goods,
- in the column *informing*, the information that is useful for mobility.

Each of the above topics is subdivided into *getting*, *disposing of*, *striving*, *performing* and *informing*. By looking up the suitable matrix on the 2nd Sublevel (Fig. 6), the first and second part of the Code is now built (column and row):

disposing of// striving (Super ordinate BAE).

There are goal and assistant BAE. Because of

synchronization with definition of objects, the goal BAE is always positioned at the second place.

Therefore the second element in the code *striving* represents the goal BAE. The first element *disposing of* is the main assistant BAE.

Disposing of, according to the Sense Machine (see Table I), is: the realization of a will through means that are within the control of the person concerned (first dimension).

Striving in the material area is: the striving to reach a destination (second dimension).

The first and the second dimensions are the super ordinate BAE.

How this is done is dealt with in the statement's part 3 and 4 (subordinate).

Table III shows the matrix located at the point of intersection of matrix column *disposing of* and matrix row *striving*. (See the complex of mobility in Fig. 6.)

In this matrix the dimensioning is specified for the 3rd time by the label in initial line in combination with the four *Options for Realization in the columns* (the 4th dimension).

The Code can precisely define the execution of the operation (fine-tuning).

The defining with the four columns is equal in all matrices whether the operation is autonomous or heteronomous, whether it is directed eccentric or concentric.

TABLE III: SUPER ORDINATE BAE: *DISPOSING OF// STRIVING*

Subordinate BAE	<i>heteron.-concent.</i>	<i>autonomous.-concentric</i>	<i>Autonom -eccentric</i>	<i>heteronom-eccentric</i>
<i>getting</i>	expect arrival	to make the decision to take a trip	head for	drive in
<i>disposing of</i>	expect arrival	get transported by order; teleport	steer	select transport line
<i>striving</i>	expect arrival; stop	start, start the engine	drive	move on, going by, ride
<i>performing</i>	expect arrival	instruct loading	route instruct	lead to destination
<i>informing</i>	expect arrival	book travel	specify route	drive by sight

But the context changes by the label in initial line. Further this context depends on the super ordinate BAE. These context givers are the dimensions of the defined activities. They are the BAE in different compositions that build an activity in a field of the matrix in addition with the four columns.

As a result, each position in the matrix defines another way of carrying out the activity, thus reflecting another fine tuning (see Table III).

For example, the position in row 3 column 3 has the following complete Code:

disposing of// striving// striving// autonomous- eccentric = *disposing of// striving// autonomous- eccentric* = drive.

The structure is:

Main assistance// Goal// subassistance// Options for Realization. Two times the same in the middle of the Code is compressed to one time.

General defining of activities works with logical ordering:

- The goal of the topic is the first ordering element. In this case it is mobility - striving (to a destination).

- The next ordering point is to fix the main assistant BAE. In this case no one is walking. Someone sits in a small cabin, operates levers and pedals and turns a round wheel. That is controlling activity = *disposing of*. Therefore the main assistant BAE handles with things that are at one's disposal (in this case the vehicle).
- The last is the defining of the Options for Realization.

A 1 Drive

Drive = *disposing of// striving// autonomous- eccentric*
 (by car) goal: *striving* to a destination
 assistance: *disposing of*
 self-determined = *autonomous*,
 outwards = *eccentric*

"Drive" means the *disposing of* a vehicle to use for reaching a destination. The moving happened *autonomous* and is directed outwards (*eccentric*).

Summary: "Drive" means self-determined *striving* directed outwards to a destination with a *disposing of* way.

A 2 Move on, Going by, Ride

Move on, = *disposing of// striving// heteronomous-eccentric*
 going by, goal: *striving* to a destination
 ride(by assistance: *disposing of*
 bus, train, external determination = *heteronomous*,
 ship) outwards = *eccentric*.

"Move on, going by, ride" means external determined *striving* directed outwards to a destination with a *disposing of* way. In contrast to "drive" the *striving* to a destination depends on circumstances. For example going by bus, continuing the striving on a bus stop by taking a new line depends on which line exists and which line goes in the right direction. These adapting to the circumstances are *heteronomous*. The determining of the details of a trip is handled by the power of *disposing of* (to use the available possibilities). But the execution is handled *heteronomous*.

Summary: The use of public transportation depends on the existing lines. Therefore a ride to a destination is under the power of *disposing of* but *heteronomous* to the given line possibilities directed outwards (*eccentric*) to the destination.

A 3 Booking travel

Booking = *disposing of// striving// informing//*
 travel *autonomous- concentric*
 goal: *striving* to a destination
 main assistance: *disposing of*
 subassistance: *informing*
 self-determined = *autonomous*,
 inwards = *concentric*.

"Booking travel" means a self-determined *striving* to a destination in a directed inwards way (*concentric*).

"Booking travel" happens in a travel agency and not on the way to the destination. It handles only information (about the travel). The travel agent creates a picture about the destination in the mind of his customer. The customer decides (*autonomous*) to make a special trip (*striving* to a destination) based on the picture in his head (*concentric*), based on *information* getting by the travel agency.

Summary: "Booking travel" is the decision by the power of *disposing of* to make a trip based on *information* located in the inner circle (*concentric*) of the traveler.

B. Important Examples with Detailed Explanation

The following examples are explained with many details. They show the main regularities of the Sense Machine. (It is necessary to follow each step of the explanation for understanding the work principles of the Sense Machine.)

Four examples of disassembling from the first and second Sublevel (4 of 28 possibilities of the Sense Machine for getting):

B 1. Buy

Buy = *getting// disposing of// heteronomous- eccentric*
 Goal: *disposing of* = to have something
 assistance: *getting* = obtain it:
 adapted to other people = *heteronomous*,
 directed outwards = *eccentric*.

"Buy" means *getting* something to have it at disposal, in contact with others (directed outwards) *heteronomously* depending of the rules of others (who fix the selling price).

Summary: In order to have something new it is necessary to *get* it. If I dispose of money I can change the money against the desired thing. In an *eccentric* way (the seller is located in the outside world) by paying a price that is fixed by the seller (*heteronomous*) I get the desired object.

B 2. Take in Possession

Take in = *disposing of// disposing of// getting//*
 possession *autonomous// eccentric*
 goal: *disposing of* = to have sth.
 main assistance: *disposing of* = power for:
 subassistance: *getting* from:
 outwards = *eccentric*.
 self-determined = *autonomous*,

"Take in possession" and "Buy" have the goal to have it (goal: *disposing of*). Whereas buy uses soft power and execute it with money *heteronomously*. "Take in possession" uses hard power = *disposing of* in an *autonomous- eccentric* way. Here the possibilities reach from power by having a claim (e. g. because it is already paid) to taking it with strong power (enforced). This power is used for: *getting* something. *Getting* is the sub assistance realized by the power of *disposing of*. *Getting* alone has no power (it is only *getting* without power as receiving, see Chapter 3 Defining of Basic Activity Elements).

Summary: "take in possession" uses *disposing* power for *getting* something *autonomous* from outwards (*eccentric*) in order to have it.

B 3. Take for Consumption

Take for = *disposing of// getting// autonomous-eccentric*
 Consumption goal: *getting* = obtain it with help of:
 assistance: *disposing of* = power for execution
 self-determined = *autonomous*,
 outwards = *eccentric*

"Take for consumption" means to *get* something self-determined from outwards (*eccentric*) with the power of *disposing of* in order to *get*/consume it. (*Getting* alone has no power, it is only receiving.)

The difference to "take in possession" is the goal. Because it is consumed, there is nothing for *disposing of* therefore the goal is only *getting*.

Summary: "Take for consume" uses *disposing*-power in

order to *get/* consume something. The activity is *autonomous* and directed outwards (*eccentric*).

B 4. Take from Stock

Take from stock = *disposing of// getting// disposing of//*
(food/consumable) *autonomous- concentric*
goal: *getting*
main assistance: *disposing of* = power
for taking
subassistance: *disposing of* = having
something in:
my inner circle = *concentric*,
self-determined = *autonomous*

As in "Take for consume" I use *disposing of* in order to take consumables. But difference is that it is not taken from outwards (*eccentric*) but from inwards (*concentric*), where I have some consumable at my disposal (second *disposing of*). (*Getting* alone has no power, it is only receiving.)

Summary: "Take from stock" means self-determined preparing (with *disposing of*) something available (second *disposing of*) of the inner circle (*concentric*) in order to *get/consume* it.

C. Two Examples from the Complex of Informing

Recall sth. = *informing// informing// disposing of//*
autonomous- concentric
goal: *informing*
subassistance: *disposing of(have)*:
main assistance: *informing*
inwards = *concentric*(in mind)
self-determined = *autonomous*

"Recall sth." is an inwards (*concentric*) and *autonomous* activity that serves the goal of *informing* by *informing* from the available *disposing of*.

Associate = *informing// informing// disposing of//*
heteronomous- eccentric
goal: *informing*
subassistance: *disposing of (have)*:
main assistance :*informing*
adapted to circumstances = *heteronomous*,
directed outwards = *eccentric*.

"Associate" is a *heteronomous* activity that depends upon information coming from outwards (*eccentric*). This information produces a new information that comes from the available(*disposing of*).

D. Summary

The five BAE are building the outer frameworks of the topic. For example, *disposing of* reaches from having something that is in my disposal to handle something that is within my power. The execution lies within my possibilities and is possible at once.

In contrast *striving* contains all actions that need some time. The execution is not sure as *disposing of*. Instead of power to do it, I need action to reach it (see Table II, row 3).

The *Options for Realization* build the inner frameworks. Within this framework is a large space. The content depends on the topic that is given by the Goal-BAE, and the assistance BAE. Autonomous concentric contains things that are available to me. Autonomous eccentric contains those things

that are from the outer world and I go on to change something in the outer world based on my determination.

Each element: the topic, the Goal-BAE, the assistance BAE, and the Options for Realization give a wide space. But together they progressively constrict the space. Finally, only a small point remains and within this point remains only one term or a half sentence that describes a single, special meaning of a term.

The methods of defining the four *Options for Realization* are no feature norms of a distribution and cannot be proved by probability. Only with using the ready defined activities it is possible to take the next step for defining objects with distributed representation. If terms fit with the topic defined by the BAE and fit with the regularities of the Options for Realization, then they must be right. It needs proving by the hand whether the activities are autonomous or heteronomous, concentric or eccentric. The 1000 activities of the Sense Machine are defined by going step by step through all topics and subtopics that are given by the combination of the BAE and the areas. (See next chapter).

VI. THE MEANING OF THE AREAS

Another structural element is the Area. The Areas give Sense Machine the diversity that is missed till here.

In essence, there are:

Interpersonal needs (closeness and love, power, sexuality, social behavior, contact),

Material needs (*getting, disposing of, striving, performing, informing*), aggressive confrontation (fight, shoot out, war, verbal dispute, legal dispute), criminal behavior, (antisocial obtaining, violence), leisure time activities (sports, games, hobbies), government facilities (public authorities, laws, court, police), infrastructure (supply lines, roads, power supply), health problems, survival fight, psychological Area.

Areas play an important role. They are a small-scale substitution for Meta Data.

- In the present case, the Area particularly defines "*striving*" as a "movement towards a geographical destination". The Area in the present case was called: activities in the material Area.

Example from Top Level:

Material area// striving// autonomous-eccentric = go to. (Penetrate in a space from outside world [5].)

- In the material Area in sub-combination with one of the other BAE *striving* refers to the respective goal of the other Basic Activity. In this case *striving* do not go to a destination but goes to a goal that is sub defined:

Examples from 1st Sublevel:

Material area// striving// Goal getting// aut.-ecc. = fetch
Material area//striving //G disposing of// aut.-ecc. =manage
Material area//striving//G performing//aut-ecc=manufacture
Material area//striving//G informing//aut.-ecc.=collect information.

- In the Area of interpersonal needs "*striving*" activities would have stood for a movement towards a sexual objective instead.

Example from Top Level:

Interpersonal area// striving// aut.-ecc. = penetrate with

penis in the body of a sexually related person [5].

- In the *Area of combative confrontation* “striving” activities would have equally stood for a movement towards a combative target.

Example from Top Level:

Combative confrontation area// striving// aut-ecc. = penetrate with a weapon inside the body of an enemy.

In all cases the activity is *striving*. The connecting point is the time needing striving movement (to a destination, an assisted goal, a sexual action or a hit/shot to an enemy target). This connecting point is the root. The above mentioned possibilities are the branches.

A small child makes first movements as root. Later the child learns the different moves to use for the different goals.

There are several variations that are connected only with a part of the 5 interpersonal BAE (sectorial variations). For example: *Area of combative confrontation* is derived from interpersonal *striving*. The *Area of friendly competition* within Games and Sports are also from the same sector. The connecting point is: It gives a winner and one or more loser.

By the Area, the Sense Machine can recognize whether an activity can produce winner and loser, and which activity can give advances for both parties. For example: give - take, sell - buy, speak - hear, etc. This touches the large field of complementary behavior. A further sectorial variation to *getting* is *antisocial obtaining* (robbery, theft, and scam). About this Area, Sense Machine recognizes that it is illegal. Further there are several high dimensional variations as the law, state authorities, court, and police.

These different topics of the behaviors are defined in wide sense by the Areas and get the more precise definition by the BAE. The five BAE vary depending on the Area. But in all variations, they go back to the five instinctual goals (more precisely: instinctual goal bundles). The BAE defines the topic and with more dimensions, also the sub sub topic precisely to the point. The last element is the realization option that is defined by the *Options for Realization* (aut.-con. etc.).

Syntax: Area// BAE// Goal BAE// BAE . . .// *Options for Realization*.

The Sense Machine immediately knows when it recognizes a term from an Area what it is about.

Just as a person only has to hear the word “driving”, or the word “bombing”, to know what is going on, the Sense Machine also quickly identifies the topic by tracing back the terms to the corresponding Areas and levels of the dimensions of the BAE. A partial identification can be enough to follow the thread of a conversation.

The following calculation shows the possible elements of Sense Machine:

The *activities* in 4 dimensional resolution depths make 5^3 BAE \times 4 Options for Realization = 500 activities.

The material and the interpersonal Area and some aggressive confrontation sectorial Areas are already defined 4-dimensional with $2\frac{1}{2}$ Areas \times 500 = 1250 activities.

The differentiation of *activities* 5-dimensional over all Areas (10 corresponding to 50 sectorial Areas), by the BAE (5^4) and by the Options for Realization (4) allows $10 \times 5^4 \times 4$ = 25000 elements. Half of it is realistic (because higher

dimensional matrices contain often some empty elements) = 12000 activities.

There are *objects* defined with 9-dimensional resolution depth (chain of 8 BAE + Options for Realization).

Therefore the differentiation of objects and concepts makes theoretical possible (with a chain of 8 BAE) $10 \times 5^8 \times 4$ Options for Realization = 15,000,000.

Because it is difficult to estimate the accumulation of objects in the different Areas (not explored), I conservatively estimate 10 times objects to activities = 120,000 objects and concepts.

VII. INTERPERSONAL AREA

As there are two sides to the same coin, material and interpersonal needs correspond with each other:

- *Getting* to *bringing closer* (in the sense of *closeness* / love).

The source for all basic necessities for a small child is the mother (and the father). To underpin the rearing of the children, the human have feelings of closeness and love. There is an emotional relation between the parents and the child because the permanent caring is important for the child. The love between man and woman is similar to understand. The caring for each other improves the survival.

In adult lives and in the material Area the sources for material things are shops.

- *Disposing of* to *commanding* (power about possession to power about people).
- *Striving* to a destination to *striving* for a *sexual* goal.
- *Performing* (professional work with payment) to *helping* (without payment).

A society needs helper. *Performing* is professional helping for other people who pays fee (material recognizing). Good *performing* is underpinned by good feelings if other people recognize and praise it. This recognizing refers to the interpersonal Area (an important drive for scientists). Of course there exists *performing* for all of the basic needs of other people (multiplication).

- *Informing* (needed information and news) to (interpersonal) contacting.

In the early period of mankind there were no newspapers, TV, books etc. Therefore information came only through contact between people. Because information helps for survival, contact is a basic need in the interpersonal Area, just as information is in the material Area.

VIII. THE OBJECTS AND THE CODE NUMBERS

Objects are the things that humans handle with their activities. They are also useful for one of the basic instincts.

There are some kinds of objects, the most important are goal related objects (I drive to <goal related object>) and assistance related objects (I drive by<assistance related object> for example a car). The following deals with goal related. This goal relation refers to the activity and is marked with §. In the next step arise new goals that refer to the kind of object marked with “G”.

In the material Area there are:

- 1) The natural objects for *getting* are Sources (shops).
- 2) The natural objects for *disposing of* are Things (that can be possessed).
- 3) The natural objects for *striving* (to a destination) are Locations.
- 4) The natural objects for *performing* are Professions.
- 5) The natural object for *informing* is Information.

These five Objects are combinable again with the 5 basic in There are 1. *Sources* (shops) of

- 1 Grocery 2 Objects to own 3 Mobility 4 Professions 5 Information

There are 2. *Things* (that can be owned)

- 1 Food 2 Possessions 3 Vehicles 4 Things of profession 5 Information devices

There are 3. *Location* for

- 1 Sources 2 Home 3 Traffic connection 4 Workplace 5 Information event

There are 4. *Professions* for

- 1 Food 2 Production 3 Mobility 4 Education 5 Information

There is 5. *Information* for

- 1 Sources 2 Things 3 Locations 4 Professions 5 News.
(The core of oral is getting food, and therefore the number 1 is sources of food i. e. grocery.)

A look over this list shows that these are the important material things that humans need. Each of the 5 times 5 = 25 objects is important for humans.

This combinability of all 5 basic instinct directions again with the 5 basic instinct directions the “multiplication” is the special feature of the Sense Machine. Some more multiplication of objects is possible. It is possible because these 5 directions are the main blocks of the human behavior. The number of combination gives the number of dimensions. This regularities rule also the interpersonal Area and the sectorial variations.

Using the above numbering Grocery has: §1// 1 and Location for sources has §3// 1. The Location for sources for food is §3// 1// 1 (one step deeper - again multiplied with the five directions: The first number (3) means Location. The second number (1) means Sources. The last number (1) means grocery). Food has §2// 1. (§ = Objects)

This numbering is the Coding. Only 5 numbers give the meaning. The special meaning of each object is generated by the multiplied numbers of objects, derived from the BAE. (These examples for numbering are very simplified and do not reach the usual resolution depth. Furthermore the *Options for Realization* are omitted.)

Together with the activities it is now possible to make simple sentences. Each sentence needs a protagonist who carries out the activity. If the activities are numbered with 1 to 5 for the 5 BAE as above the objects we have the following (see chapter 5):

Drive = *disposing of// striving// autonomous- eccentric*.
Drive = &2// G3// aut.-ecc. (See Chapter 5 A1)

Buy = *getting// disposing of// heteronomous- eccentric*.

Buy = &1// G2// het.-ecc (see Chapter 5 B1)

(& = activities, § = objects. The Goal BAE is marked with "G", chain of G's is possible.)

Protagonist (P) : drive to : grocery =

P: &2// G3// aut.-ecc. : §3// G1// G1.

Protagonist : buys : food = P : &1//G 2// het.-ecc : §2// G1.

By the numbering goal 3 (*striving*) in the term “drive”, Sense Machine knows that it needs a destination as an object (in this case, the location is grocery.) These are objects also with the code number “3” (§3).

By the numbering goal 2 (*disposing of*) in the term “buy”, Sense Machine knows that it needs as an object: a thing that can be possessed. These are objects that are also coded with “2” (§2). These simple connection from activities to objects helps in recognizing of topics and it is very similar to the thinking of humans.

Evaluation of the Chain of Motives:

Sense Machine is able to answer some questions about the motives (goals) of the Protagonist.

- 1) What is the first goal of the Protagonist?

He wants to reach a destination (drive = goal 3)

- 2) Which kind of destination has the Protagonist?

It is the location of a source/ shop (§3// G1// G1).

- 3) Which kind of source/ shop is in question?

It is a grocery (see last number of §3// G1// G1).

- 4) What is the next goal?

The Protagonist wants to have something at his disposal (buy = G2 = want to have the *disposing of* sth.).

- 5) Which kind of object does he want to have?

It is food/ consumable (something to eat or sth. to drink or sth. like toilet paper = G1 of §2// G1).

- 6) What is the last and main motive of the activities of the Protagonist?

Goal 2 (to have sth., see number 4.).

- 7) What is the last and main goal of the objects of the Protagonist?

It is food/ consumable §2// G1 (see number 5.).

Summary:

Sense Machine derives/understands the meaning of the terms through numbering of all activities and all objects; the meaning in the sense of basic instincts and motivations.

For example in the *material* Area goal 2: the wish to get something at disposal. For example goal 3: to reach a destination.

For example in the *interpersonal* Area goal 2: to get power over a human. For example goal 3: to reach a sexual goal. Further there are several other goals depending of the Area.

A crucial simplification is that the BAE always counts only up to 5 (and the Options for Realization up to 4). Much of the differentiation is carried out by the Areas. A basic instinct with one of the numbers 1 to 5 includes a bundle of activities wherein each refers to another Area.

It is possible to imagine that humans have five different activity feet. In every Area the human needs a different type of shoe for the feet. One type shoe for material Area, one type for interpersonal Area, one type for confrontation Area and so on. The basic root, the foot, in all cases is the same. The different shoes represent the branches that are adapted to the special Areas. This dimensioning makes many thousands terms and expressions possible.

Sense Machine has the Area, the Goal and the Assistance Dimensions of every of the 1000 already defined activities. Because the Goal is identical with the motivation, Sense Machine knows at any time (in real time) the motivation and

the topic (Area) of all activities and objects used (and already defined) in a dialog.

(The goals are not based on suspicions about motives, but only based on the implied aspects of the terms.)

The reducing of the activities and objects from thousands of elements to only 5 basic directions gives the computer a crucial simplified overview over the striving of humans.

Also humans have anytime an intuitive imagination of activities and objects in relation to basic wishes.

This applies for own as well as for wishes of other people. Ambiguities can be decided in same kind as humans do. Also, humans sometimes need more than one clue about the context meaning of a term. Sense Machine uses the meaning of the basic instinctual drives as basis just as human do.

Till here, the BAE dealt with cover the very large field of human complementary cooperation.

There are further variations that cover fields of rules of living together (laws, police, courts, authorities) and there are further diverse Areas of confrontation between humans.

Another issue is anticomplementary circumstances and behavior. Sense Machine gives the possibility to define anticomplementary circumstances that hinder basic neediness. To describe all these it needs several papers.

IX. CODING EXAMPLES

Finally examples of objects in the field of house and home with full dimensioning [10]:

P: Take in possession : new : house =

P: &2 // G2 // 1 // aut-ecc : %5 // het-ecc : §2 / G2 / 2 aut-con.

P: instruct : forwarding agent =

P: &3 // G4 // 2 // aut-con: §3 // G3 // 4// aut-ecc.

Forwarding agent : transport : furniture : new : house =

§3 // G3 // 4// aut-ecc : &3 // G3 // 4// aut-ecc : §2 / G2 // aut-con // 2 // aut-ecc / G 2// aut-ecc // G : %5// het-ecc : §2 / G2 / 2 //aut-con.

(& = activities, § = objects, \$ = agent noun, % = adjectives. The Goal BAE is marked with "G".)

Explanation:

Take in possession = see Chapter 5 B 2.

Adjective new = %5 // het-ecc. (not explained).

House = §2 / G2 / 2 // aut-con = the center of possession is the owned house or apartment.

Instruct = &3 // G4 // 2// aut-con = striving (&3) to reach the understanding by a businessman (G 4) for a disposing of (2) and give order (aut-con). The understanding for the wish puts the businessman (who wants to help) in the inner circle and at one's disposal. Then the ordering happens self determined to this inner circle.

Instruct has 4 parts:

- make clear what is to be done (&3 = striving activity)
- the executer who is willingly to do that (G4 = a professional performer)
- The disposing of (2) that comes with:
- The order to do it = Option for Realization: autonomous-concentric.

Forwarding agent = §3 // G3 // 4// aut-ecc = Organizer (§3) for moving to a destination (Goal 3) by a businessman who

works with things (4) in the outside world (aut-ecc). Transport = &3 // G3 // 4// aut-ecc = striving (&3) by moving to a destination (Goal 3) in a performing kind (4) in an autonomous eccentric realization. (The transport of people has a similar dimensioning.)

Agent Noun:

A term with a preceding "\$" means agent noun with the same topic as the activity.

For example &3 // G3 // 4// aut-ecc means transport.

For example §3 // G3 // 4 // aut-ecc means forwarding agent.

In a sentence it is possible to use agent noun as grammatical subject.

Remarks to the following Tables:

The owned house or apartment (Table IV) with Code: §2 / G2 // aut-con// defines the stationary immobile (auton.-concentric) center of possession (G2). It gives the disposal of the basics.

In contrast the portable possessions can be moved (auton.-eccentric).

The column *autonomous-concentric* gives the power about possibilities whereas *autonomous-eccentric* means action i. e. making or managing something. *Heteronomous-eccentric* possessions gives the disposal of something adapted to the conditions of other people or circumstances (example: the price fixing).

Within the framework of the Options for Realization, the content of the activities are defined by the topic givers: the Area and the chain of the diverse BAE.

Tables IV to Table VII are building a chain that leads deeper in the matter of house and apartment (to furniture).

TABLE IV: SUPER ORDINATE BAE: §2/ G (POSSESSION)

Subordinate	h-c	auton.-concentr.	auton.-eccentr.	heter.-eccentric
1 getting		food, consumables	dine, beverages	
2 disposing of		house; apartment	portable possession	money, bank balances, shares
3 striving		gasoline	vehicles	tickets
4 performing		contracts; design drawings	goods	work performance
5 informing		home page		

TABLE V: SUPER ORDINATE BAE: §2/ G2// AUT-CON// (HOUSE; APARTMENT) CONVERGENT MATRIX

Subordinate	h-c	auton.-concentr.	auton.-eccentric	heter.-eccentric
1 getting		hire	moving in	house buying
2 disposing of		room type	equipment of apartment	ownership coast; rent
3 striving		contract rules	facility management	financing
4 performing		rentals	repair, renovation, cleaning, craft	acceptance of price, of rent
5 informing		real estate knowledge	knowledge of building problems	house, apartment price adequacy

TABLE VI: SUPER ORDINATE BAE: §2/ G2// AUT-CON// 2// AUT-ECC// G (EQUIPMENT OF APARTMENT)

Subordinate	h.-c.	aut.-concent.	autonom.-eccentric	het.-eccentr.
1 getting			crockery, cutlery, pots, pans	
2 disposing of			furniture	
3 striving				
4 performing			electrical appliances	
5 informing		nameplate, address	telefon connection, internet connection	lighting

TABLE VII: SUPER ORDINATE BAE: §2/ G2// AUT-CON// 2// AUT-ECC// G 2// AUT-ECC//G (FURNITURE)

Subordinate	het.-conc.	aut.-conc.	autonom.-eccentr.	het.-eccentric
1 getting	bed, lounge	cabinet, shelving	kitchen furniture; dining table	children furniture
2 disposing of		chair, sofa, stool	table	
3 striving		wardrobe	shoe cabinet	
4 performing			workbench	desk; filing cabinet
5 informing				TV cabinet; bookshelf

These matrices combine again and again *getting*, *disposing of*, *striving*, *performing* and *informing*. Each matrix in the chain extends the super ordinate BAE for the following matrix.

X. CONCLUSIONS

This paper tries to show the principles of the Sense Machine. The material and especial the interpersonal Area give new possibilities to follow the striving of humans. Because of the psychological basis of the Sense Machine there are several possibilities to analyze longer dialogues between Sense Machine and humans.

Sense Machine captures the meaning of words by precise disassembling of word content with unitary high differentiating tools. This gives the possibility to understand short texts *without* text corpora in a large field of themes. Sense Machine allows the encoding of simple structured descriptive sentences that relate to a protagonist. In the sentence structure: *subject - predicate - object* Sense Machine can encode the activity and the object (including a number of adjectives). The subject has to be a protagonist (or agent noun) that performs the activities. This encoding is a machine language representation of descriptive natural language texts.

Thanks to its uniform system, Sense Machine can make a large number of associations and cross-associations across all Areas. (This is important for an accompanying analysis during a dialogue.) Sense Machine can correspondingly associate actions to human motivations and thus “understand” (as far as possible for a machine) through the ability of tracing back activities, objects and concepts to an Area and within an Area to the instinctual goals at any given time. This identification of the underlying central basic wish is extremely important and can be used to find the right content in case of ambiguous texts.

A similar process takes place in a conversation between people. The listener intuitively classifies the goal of the narrator's actions. This identification of the central idea, the point that the narrator is ultimately trying to make, is an extremely important part of semantic recognition.

Sense Machine is a very large field by itself. Activities, objects, agent noun and adjectives must be defined and that also for many different Areas.

The field of anti-complementary circumstances and anti-complementary behavior is very large and this alone needs years of development. Further it needs cooperation for a special kind of latent semantic analysis for finding objects that refers to activities for extending the database of objects.

Basically, Sense Machine is *not* meant to compete with ontological semantic networks. On its own, it is *not* suited for the field of professional knowledge and logical inferences. A perfect whole can only be created in combination with conventional semantic networks and knowledge databases. Additional elements of artificial intelligence, such as morphological analysis, taxonomy, recognizing grammar, time (and tense), negation, active/passive voice, quantities are not within the scope of the Sense Machine but they are needed as a substructure. Sense Machine needs cooperation with scientists who complete the work with these techniques. Further the cooperation of the text corpus-based macro world and the disassembling micro world of Sense Machine again is a large field that cannot be dealt within short and needs a further paper.

Finally only the use of both systems could facilitate the best transition, from human aspiration to knowledge databases. One of the five BAE in the material Area is the obtaining of information. Sense Machine therefore always recognizes contexts in which information might be of interest to a user. Sense Machine complements what is missing and opens up a view on human motivation. It can assign and classify human actions to their origins and their deeper meaning.

The name says it all:

Sensitive Semantic Machine = Sense Machine.

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Peter H. Pfeifer was born in Ruedersdorf near Berlin, 1944. He studied in Business school from 1964 to 1966.

He took over from his father, a building services company and led them till 2012. He concerned himself with developmental psychology and made a psychotherapy that led back to the babyhood. He acquired knowledge auto didactically in the field of economic informatics and in the crossroads area of psychology and computer science.

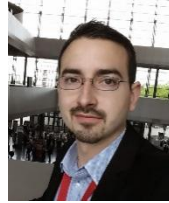
Since 2007, he worked at the Sense-Machine, intended to make the detection of human motives possible by the computer. The Sense Machine Project began together with the sons Niko and Julian 2009.



Julian Pfeifer was born in Berlin, 1988. He got the general qualification for university entrance at the Ulrich von Hutten Gymnasium 2007.

He is a student of informatics at Freie Universität Berlin, Germany. He got a position as a student researcher at Fraunhofer Institute for open communication systems in Berlin, Germany in 2011 and is still working there today alongside his studies.

Mr. J. Pfeifer takes part in the Sense Machine Project since 2009.



Niko Pfeifer was born in Berlin, 1985. He went to School of Electrical Engineering from 2002 to 2004. He completed his civilian service in 2004 and got his Dipl.-Inf. (FH) at Beuth Hochschule für Technik, Berlin from 2005 to 2009.

He worked as student researcher at Fraunhofer Institute for open communication systems in Berlin from 2008 to 2009, as research fellow at Technische Universität Berlin from 2009 to 2011 and as research fellow at Fraunhofer Institute for Open Communication Systems in Berlin, Germany since 2011. Mr. N. Pfeifer takes part in the Sense Machine Project since 2009.